The above-identified Office Action was a final rejection of Claims 1-24 of the referenced application. However, the application is believed to be in condition for allowance because the claims are not obvious over the cited art. As such, the applicants hereby respectfully request further examination and reconsideration of the subject application. The reasons for this belief in the non-obviousness of the rejected claims are presented below.

The 35 USC 103 Rejection of 1-11 and 16.

Claims 1-11 and 16 were rejected under 35 USC 103(a) as being unpatentable over Yan et al's publication, in view of Kung, U.S. Patent No. 5,850,470. The Examiner stated that Yan discloses a deformable model of a realistic face but does not teach the training of a 3D face recognizer for face recognition. However, the Examiner further contended that Kung teaches a facial recognition system using a data base of images to train the recognizer. The applicants respectfully disagree with this contention of obviousness.

In order to deem the applicants' claimed invention unpatentable under 35 USC 103, a prima facie showing of obviousness must be made. To make a prima facie showing of obviousness, all of the claimed elements of an applicant's invention must be considered, especially when they are missing from the prior art. If a claimed element is not taught in the prior art and has advantages not appreciated by the prior art, then no prima facie case of obviousness exists. The Federal Circuit court has stated that it was error not to distinguish claims over a combination of prior art references where a material limitation in the claimed system and its purpose was not taught therein (*In Re Fine*, 837 F.2d 107, 5 USPQ2d 1596 (Fed. Cir. 1988)).

The applicants claim a system and method that allows for face recognition even in the absence of a significant amount of training data. Further, it can recognize faces at various pose angles without the need to capture training images exhibiting the

corresponding pose. This is accomplished by synthesizing training images depicting a subject's face at a variety of poses from a small number of actual images of the subject's face. The system and process according to the claimed invention employs a generic 3-D graphic face model and the small number of images of the subject's face in an automatic deformation technique to create a single, specific 3-D face model of the subject from the generic model and images. A subdivision spline surface construction technique is next used to "smooth" the specific 3-D face model and a multi-direction texture mapping technique is used to endow texture or photometric detail to the face model to create a texturized, smoothed, specific, 3-D face model. This technique adds realism to the synthetic human faces.

Once a 3-D face model of a specific subject is obtained, realistic individual virtual faces or 2-D face images are synthesized at various poses to create groups of training images for input into a "recognizer" to allow for training of the recognizer. It is also optionally possible to take the generated images and synthetically vary the illumination to produce each image at various illuminations. In this way, subjects can be recognized regardless of the illumination characteristics associated with an input image.

In contrast, Yan teaches a human face generation technique using a three-dimensional deformation technique. The deformation technique allows interactive alignment of features in the general geometric face model with the features of the multi-direction images of the specific human face which are pre-provided by the animator. The deformation result provides an approach to generate 2D images exhibiting a **facial expression.** As the Examiner stated Yan does not teach the training of a 3D face recognizer for face recognition. More importantly, the cited **Yan reference does not teach the synthesis of training images exhibiting different face poses of a subject or the training of a 3D face recognizer <u>using synthesized images</u>.**

Although the applicants pointed out this distinction in the last Office Action, the **Examiner did not respond to this distinction of synthesizing pose-varying training**

images used to train a 3D face recognizer. Yan simply does not teach this claimed feature. Rather Yan teaches creating a specific face model for generating images of a subject that exhibit different facial expressions, not face poses. It is noted that a face pose is a term of art meaning the pitch, roll and yaw angles defining the direction a face is pointed in relation to a full frontal view.

The application of Kung does nothing to change the fact that the cited art combination lacks the claimed synthesizing and training features of the applicants' claimed invention. Kung discloses a system for automatically detecting and recognizing the identity of a deformable object such as a human face, within an arbitrary image scene. The system comprises an object detector implemented as a probabilistic DBNN, for determining whether the object is within the arbitrary image scene and a feature localizer also implemented as a probabilistic DBNN, for determining the position of an identifying feature on the object such as the eyes. A feature extractor is coupled to the feature localizer and receives coordinates sent from the feature localizer which are indicative of the position of the identifying feature and also extracts from the coordinates information relating to other features of the object such as the eyebrows and nose, which are used to create a low resolution image of the object. A probabilistic DBNN based object recognizer for determining the identity of the object receives the low resolution image of the object inputted from the feature extractor to identify the object. The system 10 comprises a video camera 12 for inputting an arbitrary image scene 11 with 320 by 240 pixels. A DBNN-based face detector 14 is coupled to the video camera 12 and includes a memory 16 which operates as a database for storing images of different human faces. The face detector 14 determines whether a face is within the arbitrary image scene 11. The data stored in the face database 16 is used to train the face detector 14. During training, updated network weighting parameters and thresholds are stored in the face database 16. **However, Kung does not teach synthesizing images of different face poses from a specific model of a subject and using these synthesized images to create the aforementioned database. Rather, Kung teaches extracting a large number of**